AMENDMENTS TO THE CLAIMS

1. (Currently amended) An optical pulse regenerator comprising: ~~means~~

an optical pulse reshaper for broadening ~~the~~ temporal widths and flattening ~~the centre~~ center portions of an optical pulse ~~in optical communication, using;~~

a saturable absorber coupled to the optical pulse reshaper; ~~such as, an unbalanced optical interferometer,~~ and

~~with~~ an optical amplifier coupled to the optical pulse reshaper.

2. (Currently amended) An optical pulse regenerator according to claim 1, where the optical pulse reshaper includes a section of normal dispersion fiber ~~means for broadening the temporal widths and flattening the centre portions of~~ the ~~optical pulse comprises a section of optical fibre having a negative dispersion coefficient, that is a section of normal dispersion fibre~~.

3. (Currently amended) ~~A regenerator according to claim 2, wherein, for a defined amount of pulse amplification by the optical amplifier, the adequate length of the normal dispersion fiber fibre for a suitable power level at the fibre output is determined by the trade-off between the effects of dispersion, non-linearity and attenuation in the fibre.~~ An optical pulse regenerator according to claim 2 wherein the section of normal dispersion fiber has a negative dispersion coefficient.

4. (Currently amended) ~~A regenerator according to any preceeding claim, wherein the unbalanced interferometer is a Sagnac interferometer and preferably a fibre optic Sagnac interferometer.~~ An optical pulse regenerator according to claim 1 wherein the saturable absorber includes an unbalanced optical interferometer.

5. (Currently amended) ~~A regenerator according to claim 4, wherein the interferometer is a non-linear loop mirror.~~ A regenerator according to claim 1, wherein, for a defined amount of pulse amplification by the optical amplifier, the adequate length of the normal dispersion fiber for a

suitable power level at a fiber output is determined by the trade-off between the effects of dispersion, non-linearity and attenuation in the fiber.

6. (Currently amended) ~~A regenerator according to claim 5, wherein the non-linear loop mirror comprises a 2 x 2 optical coupler, a first port on one side of the coupler forming the input to the non-linear optical loop mirror, the second port on the one side forming the output to the non-linear optical loop mirror, and the ports on the side of the coupler being connected together by a section of optical waveguide, to form a waveguide loop.~~ A regenerator according to claim 1, wherein the unbalanced interferometer is a Sagnac interferometer.

7. (Currently amended) ~~A regenerator according to claim 6, wherein the optical coupler is a fibre optic coupler or a semiconductor waveguide device, and the optical waveguide comprises a section of the optical fibre and/or a section of semiconductor waveguide.~~ A regenerator according to claim 6, wherein the interferometer is a non-linear loop mirror.

8. (Currently amended) ~~A regenerator according to any of claims 5 to 7, wherein the non-linear loop mirror is~~

~~an absorption non-linear loop, mirror, comprising an absorption element asymmetrically located within the fibre loop, or~~

~~an amplifying non-linear loop mirror, comprising an optical amplifier asymmetrically located within the fibre loop, or~~

~~a dispersion unbalanced non-linear loop, mirror, or~~

~~an unbalanced coupler non-linear loop mirror.~~

A regenerator according to claim 7, wherein the non-linear loop mirror comprises a 2 x 2 optical coupler, a first port on one side of the coupler forming an input to the non-linear loop mirror,

a second port on the one side forming an output to the non-linear loop mirror, and ports on another side of the coupler being connected together by a section of optical waveguide, to form a waveguide loop.

9. (Currently amended) ~~A regenerator according to any of claims 5 to 8, wherein the non-linear loop mirror operates within a region of its switching curve in which the output power of the non-linear loop mirror is substantially stables against small changes in the output power from the means for pulse broadening and flattening.~~ A regenerator according to claim 8, wherein the optical coupler is one of the following: a fiber optic coupler and a semiconductor waveguide device, and the optical waveguide comprises at least one of the following: a section of the optical fiber and a section of semiconductor waveguide.

10. (Currently amended) ~~A regenerator according to claim 10, wherein the non-linear loop mirror operates in the region just after the first peak of its switching curve.~~

A regenerator according to claim 7, wherein the non-linear loop mirror is one of the following:

an absorption non-linear loop mirror, comprising an absorption element asymmetrically located within a fiber loop;

an amplifying non-linear loop mirror, comprising an optical amplifier asymmetrically located within a fiber loop;

a dispersion unbalanced non-linear loop mirror; and

an unbalanced coupler non-linear loop mirror.

11. (Currently amended) ~~A regenerator according to any preceding claim, wherein the optical amplifier adjusts the pulse power to a suitable level for input to the saturable absorber such~~

~~as just after the first peak of its switching curve of the non-linear loop mirror.~~ A regenerator according to claim 7, wherein the non-linear loop mirror operates within a region of its switching curve in which the output power of the non-linear loop mirror is substantially stable against small changes in output power from the optical pulse reshaper.

12. (Currently amended) ~~A regenerator according any of claims 5 to 10, wherein the length of the loop is determined in terms of the input power to the non-linear loop mirror.~~ A regenerator according to claim 11, wherein the non-linear loop mirror operates in a region after a first peak of its switching curve.

13. (Currently amended) ~~A regenerator according to any of claims 5 to 10, wherein the non-linear loop mirror fibre loop is a loop of dispersion-shifted fibre.~~ A regenerator according to claim 7, wherein the optical amplifier adjusts pulse power to a level for input to the saturable absorber which is after a first peak of its switching curve of the non-linear loop mirror.

14. (Currently amended) ~~A regenerator according to any preceding claim, wherein the optical amplifier is a lumped erbium-doped fibre amplifier or a distributed Raman fibre amplifier.~~ A regenerator according claim 7, wherein a loop length of the non-linear loop mirror is determined in terms of input power to the non-linear loop mirror.

15. (Currently amended) ~~A regenerator according to claim 14, wherein the normal dispersion fibre providing means for pulse broadening and flattening is used as the amplifying medium.~~ A regenerator according to claim 7, wherein the non-linear loop mirror comprises a loop of dispersion-shifted fiber.

16. (Currently amended) ~~A regenerator according to claim 15, wherein the distributed Raman fibre amplifier is:~~

~~bi-directionally pumped by a forward pump and a backward pump, or~~

~~the pumping is realized in a single direction,~~

~~either co-directionally with the propagating signal or~~

~~counter-directionally and accordingly has one pump.~~

A regenerator according to claim 1, wherein the optical amplifier is a lumped erbium-doped fiber amplifier or a distributed Raman fiber amplifier.

17. (Currently amended) ~~A regenerator which combines the intensity filtering action of a saturable absorber, such as a non-linear loop mirror, for achieving 2R-regeneration of an optical signal with broadening of the temporal widths and flattening of the centre portions of an optical pulse, such as produced by dispersion and non-linearity in a normal dispersion fibre, for improvement of the signal phase margin.~~

A regenerator according to claim 16, wherein the optical pulse reshaper includes a section of normal dispersion fiber which acts as an amplifying medium.

18. (Currently amended) ~~A regenerator according to claim 17, whose application in optical communication provides both suppression of noise and radiative background in the zero timing slots of an optical signal and reduction of the amplitude jitter of ones, and reduction of the impact of timing jitter without increasing the intersymbol interference.~~

A regenerator according to claim 17, wherein the distributed Raman fiber amplifier is one of the following:

bi-directionally pumped by a forward pump and a backward pump; or

pumped with one pump in a single direction, which is one of the following:

co-directionally with a propagating signal; and

counter-directionally.

19. (Currently amended) ~~An optical pulse regenerator according to claims18 for use in an optical transmission system such as a transmission system employing single-channel optical data signals or wavelength-division multiplexed data signals.~~

A regenerator comprising:

a saturable absorber that provides intensity filtering for achieving 2R regeneration of an optical signal; and

a normal dispersion fiber that provides broadening of temporal widths and flattening of center portions of an optical pulse for improvement of signal phase margin.

20. (Currently amended) ~~An optical pulse regenerator according to claim 19, which is applied in optical transmission systems after signal demultiplexing.~~

A regenerator according to claim 19, wherein the optical signal comprises an optical communication signal, and wherein the regenerator provides:

suppression of noise and radiative background in zero timing slots of the optical communication signal and reduction of amplitude jitter of ones; and

reduction of the impact of timing jitter without increasing intersymbol interference.

21. (Currently amended) ~~An optical pulse regenerating component within an optical return-to-zero receiver having the features of the regenerator of any of claims 1 to 20.~~ A

regenerator according to claim 20 wherein the optical communication signal comprises one of the following: a single-channel optical data signal and a wavelength-division multiplexed data signal.

22. (Currently amended) ~~An optical pulse regenerating unit/component according to claim 21 for improving the performs signal quality before detection.~~ A regenerator according to claim 21, wherein the optical communication signal is received from an optical transmission system after signal demultiplexing.

23. (Currently amended) ~~An optical pulse shaper for transferring return-to-zero optical pulses to non-return-to-zero-like pulses having the features of the regenerator of any of claims 1 to 20.~~

An optical pulse regenerator according to claim 1, where in the optical pulse regenerator is within an optical return-to-zero receiver.

24. (Currently amended) ~~An optical pulse shaper according to claim 23, wherein the transfer of return-to-zero pulses to non-return-to-zero-like pulses occurs through broadening of the temporal widths and flattening of the centre portions of the pulses, such as produced by dispersion and non-linearity in a normal dispersion fibre .~~ An optical pulse regenerator according to claim 23, wherein the optical pulse regenerator performs signal quality regeneration before detection.

25. (Currently amended) ~~An optical pulse shaper according to claims 23 or 24, which produces non-return-to-zero-like pulses having a rectangular-like temporal profile or a parabolic temporal profile.~~

An optical pulse shaper comprising:

an optical pulse reshaper for broadening temporal widths and flattening center portions of an optical pulse in optical communication, and enabling transfer of return-to-zero optical pulses to non-return-to-zero-like pulses;

a saturable absorber coupled to the optical pulse reshaper; and

an optical amplifier coupled to the optical pulse reshaper.

26. (Currently amended) ~~An optical pulse regenerating unit comprising a housing containing components of a regenerator according to any preceding claim.~~ An optical pulse shaper according to claim 25, wherein the optical pulse reshaper includes a section of normal dispersion fiber.

[[26.]] 27. (Currently amended) ~~A method of regenerating a signal of optical pulses comprising the steps of;~~

~~amplifying the pulse power;~~

~~transmitting the signal through a section of fibre with negative dispersion coefficient to broaden the widths and flatten the centres of the pulses through dispersion and Kerr non-linearity and~~

~~transmitting the amplified broadened and flattened signal through a saturable absorber such as an unbalanced NOLM to reduce pulse distortion and amplitude noise.~~

An optical pulse reshaper according to claim 26, wherein the section of normal dispersion fiber has a negative dispersion coefficient.

[[27.]] 28. (Currently amended) ~~The use of an unbalanced interferometer and a fibre with negative dispersion coefficient to reduce the effects of pulse distortion, amplitude noise and timing jitter in regenerating an optical pulse signal.~~ An optical pulse shaper according to claim 25, wherein the transfer of return-to-zero pulses to non-return-to-zero-like pulses occurs through broadening of the temporal widths and flattening of the centre portions of the pulses produced by dispersion and non-linearity in ~~a~~ the normal dispersion fiber.

29. (New) An optical pulse shaper according to claim 25, which produces non-return-to-zero-like pulses having a rectangular-like temporal profile or a parabolic temporal profile.

30. (New) A regenerator according to claim 19, further comprising a housing containing the saturable absorber and the normal dispersion fiber.

31. (New) A method of regenerating a signal of optical pulses comprising;

amplifying the pulse power of the signal,

transmitting the signal through a section of fiber with negative dispersion coefficient to broaden the widths and flatten the centers of the pulses through dispersion and Kerr non-linearity and

transmitting the amplified broadened and flattened signal through a saturable absorber comprising an unbalanced non-linear optical loop mirror to reduce pulse distortion and amplitude noise.

32. (New) The method of claim 31, further comprising using an unbalanced interferometer and the fiber with negative dispersion coefficient to reduce the effects of pulse distortion, amplitude noise and timing jitter in regenerating the signal.